REMARKS

Response to Restriction Requirement

The USPTO requires restriction to one of the two following groups:

Group I: Claim 1-19 and 29, which according to the USPTO are "drawn to transgenic plants, genetically modified plant cells and harvestable parts from said transgenic plants and methods for producing transgenic plants all comprising a foreign nucleic acid molecule that reduces the activity of at least one OK1 protein."[1]

Group II: Claims 20-23 and 25-27, which according to the USPTO are "drawn to modified starches, derived starches and methods for manufacturing said starches."[2]

Applicants provisionally elect **Group I**, which covers, according to the USPTO, claims 1-19 and 29, which are said to be drawn to transgenic plants, genetically modified plant cells and harvestable parts from said transgenic plants and methods for producing transgenic plants all comprising a foreign nucleic acid molecule that reduces the activity of at least one OK1 protein, **with traverse**. Applicants reserve their right to request rejoinder in the instant application and to file a divisional application to the non-elected subject matter.

I. Groups I and Group II are Linked by a Special Technical Feature That Constitutes an Advancement Over the Prior Art

The USPTO asserts that restriction is appropriate because the technical feature linking Groups I and II—"modified starch from transgenic plants"—does not constitute an advancement over the art.[3] Specifically, the USPTO contends that this technical feature is disclosed in Frohberg (U.S. Patent 6,521,816).[4]

Applicants respectfully traverse.

First, Applicants submit that the technical feature linking Groups I and II is *not* "modified starch from transgenic plants," but is instead a reduction of an OK 1 protein. Indeed, the claims of Group I are directed to genetically modified plant cells and plants

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[1] Office Action, p. 2.

[2] *Id.*

[3] *Id.*

[4] *Id.*

having a reduced OK 1 protein activity, and the claims of Group II are directed to starch obtained from these genetically modified plant cells and plants.[5]

Second, Frohberg does not teach the technical feature linking Groups I and II. Frohberg discloses a R1 protein and a modified starch that has been phosphorylated by the R1 protein.[6] R1 and OK1 proteins are distinct enzymes that catalyze *different* reactions. According to the Enzyme Commission (EC) number system of the International Union of Biochemistry and Molecular Biology (IUBMB), R1 proteins are classified as EC 2.7.9.4, whereas OK1 proteins are classified as EC 2.7.9.5.[7] According to the IUBMB, the R1 protein phosphorylates glucose residues in glucans, while the OK1 protein is only capable of phosphorylating phosphoglucans (i.e., glucans that have previously been phosphorylated). Significantly, R1 proteins predominantly phosphorylate glucose residues at the C-6 position, while OK1 proteins predominantly phosphorylate glucose residues at the C-3 position.[8] Indeed, when R1 protein activity is reduced, the resulting starch will have a decreased phosphorylation at the C-6 position, whereas when OK 1 protein activity is reduced, the resulting starch will be affected in the phosphorylation levels at the C-3 position. Accordingly, because the technical feature linking Groups I and II— a reduction of an OK 1 protein—is not taught by Frohberg, Applicants respectfully request that the restriction requirement be withdrawn.

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[5] *See, e.g.*, claim 1 ("A genetically modified plant cell, which has a reduced activity of at least one OK1 protein..."); claim 6 ("A plant comprising one or more plant cells according to claim 1"); claim 20 ("A modified starch obtainable from a genetically modified plant according to claim 6...")

[6] *See, e.g.*, Frohberg, col. 1, ll. 7-13 ("The present invention relates to nucleic acid molecules encoding an R1-protein from rice as well as to methods and recombinant DNA molecules for the production of transgenic plant cells and plants synthesizing modified starch."); *see also* col. 6, ll. 21-25; col. 10, ll. 30-35; Example 1.

[7] *See* IUBMB Enzyme Nomenclature, EC 2.7.9.4 (**Exhibit A**); *see also* IUBMB Enzyme Nomenclature, EC 2.7.9.5 (**Exhibit B**).

[8] *Id.*

II. The "Independent and Distinct" Standard Is Inappropriate for National Stage Applications Filed Under 35 U.S.C. § 371

The USPTO also asserts that restriction is proper because "the inventions are independent and distinct from one another because ... the starch of Group II may be produced by chemical means or with unrelated transgenic plants."[9]

Applicants point out, however, that the "independent and distinct" standard does *not* apply to national stage applications filed under 35 U.S.C. § 371:

> Examiners are reminded that unity of invention (***not restriction practice pursuant to 37 C.F.R. 1.141-1.146***) is applicable...in national stage applications submitted under 35 U.S.C. 371.[10]

The instant application is a 371 National Stage filing of PCT/EP2005/002450. Accordingly, because the applicable restriction standard in the instant application is the "unity of invention" standard, *not* the "independent and distinct" standard, Applicants respectfully request withdrawal of the restriction requirement.

Furthermore, even if the "independent and distinct" standard were applicable—which it is not—Applicants disagree with the USPTO's assertion that "the starch of Group II may be produced by chemical means."[11] As discussed above, when OK 1 protein activity is reduced, the resulting starch will be affected in the phosphorylation levels at the C-3 position. Chemically synthesized modified starches, however, are not capable of being selectively phosphorylated in the same manner as starches phosphorylated by the OK1 protein. Accordingly, the starch of Group II could *not* be produced by traditional chemical means.[12]

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[9] Office Action, p. 2.

[10] M.P.E.P. § 1893.03(d) (emphasis added).

[11] Office Action, p. 2.

[12] Applicants also point out that the USPTO has not provided any evidence that "the starch of Group II may be produced with unrelated transgenic plants." If the USPTO maintains the restriction requirement, then Applicants respectfully request that the USPTO provide evidence to support its assertions.

CONCLUSION

In view of the above remarks, withdrawal of the instant restriction requirement is respectfully requested. An indication of allowance of all claims is also respectfully requested.

This response is filed within one month of the mailing date of the Restriction Requirement. Accordingly, no fees are due for entry of this response. Should any fees be required to enter this response, however, the USPTO is authorized to charge such fees to **Deposit Account No. 50-0206**.

Respectfully submitted,

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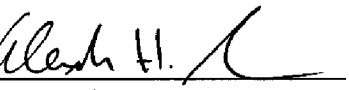
Dated: April 30, 2009 By: 

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Exhibit A

IUBMB Enzyme Nomenclature

EC 2.7.9.4

Accepted name: α-glucan, water dikinase

Reaction: ATP + α-glucan + H_2O = AMP + phospho-α-glucan + phosphate

Other name(s): starch-related R1 protein, GWD

Systematic name: ATP:α-glucan, water phosphotransferase

Comments: Requires Mg^{2+}. ATP appears to be the only phosphate donor. No activity could be detected using GTP, UTP, phospho*enol*pyruvate or diphosphate [1]. The protein phosphorylates glucans exclusively at the O-6 position of glucosyl residues [2]. The protein phosphorylates itself with the β-phosphate of ATP, which is then transferred to the glucan [1].

Links to other databases: BRENDA, EXPASY, KEGG, ERGO, CAS registry number: 664327-94-0

References:

1. Ritte, G., Lloyd, J.R., Eckermann, N., Rottmann, A., Kossmann, J. and Steup, M. The starch-related R1 protein is an α-glucan, water dikinase. *Proc. Natl. Acad. Sci. USA* 99 (2002) 7166-7171. [PMID: 12011472]

2. Ritte, G., Heydenreich, M., Mahlow, S., Haebel, S., Kötting, O. and Steup, M. Phosphorylation of C6- and C3-positions of glucosyl residues in starch is catalysed by distinct dikinases. *FEBS Lett.* 580 (2006) 4872-4876. [PMID: 16914145]

[EC 2.7.9.4 created 2002]

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Exhibit B

IUBMB Enzyme Nomenclature

EC 2.7.9.5

Accepted name: phosphoglucan, water dikinase

Reaction: ATP + [phospho-α-glucan] + H_2O = AMP + *O*-phospho-[phospho-α-glucan] + phosphate

Other name(s): PWD; OK1

Systematic name: ATP:phospho-α-glucan, water phosphotransferase

Comments: The enzyme phosphorylates granular starch that has previously been phosphorylated by EC 2.7.9.4, α-glucan, water dikinase; there is no activity with unphosphorylated glucans. It transfers the β-phosphate of ATP to the phosphoglucan, whereas the γ-phosphate is transferred to water [1]. In contrast to EC 2.7.9.4, which phosphorylates the glucose groups in glucans predominantly on the O-6 position, this enzyme phosphorylates glucose groups in phosphorylated starch predominantly on O-3 [2]. The protein phosphorylates itself with the β-phosphate of ATP, which is then transferred to the glucan [1].

Links to other databases: BRENDA, EXPASY, KEGG, ERGO, CAS registry number: 912567-76-1

References:

1. Kötting, O., Pusch, K., Tiessen, A., Geigenberger, P., Steup, M. and Ritte, G. Identification of a novel enzyme required for starch metabolism in *Arabidopsis* leaves. The phosphoglucan, water dikinase. *Plant Physiol.* 137 (2005) 242-252. [PMID: 15618411]

2. Ritte, G., Heydenreich, M., Mahlow, S., Haebel, S., Kötting, O. and Steup, M. Phosphorylation of C6- and C3-positions of glucosyl residues in starch is catalysed by distinct dikinases. *FEBS Lett.* 580 (2006) 4872-4876. [PMID: 16914145]

[EC 2.7.9.5 created 2005]